6.9.4

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

IN REPLY
REFER TO: OEA-095 January 11, 1999
MEMORANDUM

SUBJECT: Bunker Hill, CLP Metals Analysis, Data Validation
Case: 26610
SDG: MJAE16

FROM: Laura Castrilli, Chemist
Quality Assurance and Data Unit, OEA

TO: Mary Kay Voytilla, Regional Project Manager
Office of Environmental Cleanup

CC: Bruce Woods, Region 10 CLP TPO
Jim Stefanoff, CH2M Hill

The following is a validation of ICP-AES and mercury analyses of eleven water samples from the Bunker Hill project. The analyses were performed following the USEPA Contract Laboratory Program Statement of Work for Inorganics Analysis Multi-media, Multi-Concentration, ILM04.0. Analyses were conducted by Sentinel Inc. of Huntsville, Alabama. This validation was conducted for the following samples:

Total (unfiltered) samples:

MJAE16	MJAE18	MJAE23	MJAE25
MJAE17	MJAE22	MJAE24	MJAE26

Dissolved (filtered) samples:

MJAE19 MJAE20 MJAE21

Data Qualifications

The following comments refer to the Sentinel Laboratory's performance in meeting quality control specifications outlined in the *CLP Statement of Work (CLP-SOW) for Inorganic Analysis, rev. ILM04.0.* The comments presented herein are based on the information provided for the review.

1.0 Timeliness - Acceptable

The technical (40 CFR part 136) holding time from the date of collection for mercury in water is 28 days. The holding time for the remaining metals in water is 180 days. The samples were collected

between 11/06/98 and 11/13/98. Mercury analyses were completed on 11/24/98. ICP-AES analyses were completed on 12/09/98.

2.0 Sample Preparation - Acceptable

The samples were prepared for mercury analysis on 11/19/98. The samples were prepared for ICP-AES analysis on 11/23/98.

3.0 Calibrations/Calibration Verifications - Acceptable

The samples were analyzed for mercury by CVAAS on 11/24/98. Initial calibration included one blank and five standards. The curve was linear with a correlation coefficient greater than 0.995.

The samples were analyzed by ICP-AES on 11/29/98 (main analyses), 12/02/98 (ten fold dilutions for zinc in most samples, and iron and manganese in sample MJAE26), and 12/09/98 (one hundred fold dilutions for samples MJAE25 (iron reported) and MJAE26 (zinc reported) and a five hundred fold dilution for zinc in sample MJAE25). The instrument was standardized according to the analytical method each day of analysis using one blank and a single calibration standard for each element.

All ICP-AES and CVAAS (mercury) calibrations were performed as required and met the acceptance criteria; therefore, no qualification was made on this basis.

Calibration verification samples are required before and after sample analysis and after every 10 samples during analysis. Mercury recoveries must be within 80-120%. Other metal recoveries must be within 90-110%. All ICP-AES and CVAAS (mercury) calibration verification (initial and continuing) samples bracketing reported sample results met the recovery criteria. Calibration verification samples were analyzed after every ten samples. No qualification was made based on ICP-AES or CVAAS calibration verification.

4.0 Laboratory Control Samples - Acceptable

Laboratory Control samples are digested and analyzed along with the samples to verify the efficiency of laboratory procedures. All recoveries associated with reported sample results met the acceptance criteria for control samples.

5.0 Blanks -

Procedural blanks were prepared with the samples to show potential contamination from the digestion or analytical procedure. If an analyte was found in the associated blank, the sample results were qualified if the analyte concentration was less than five times the analytical value in the blank.

Aluminum, cadmium, calcium, iron, magnesium, manganese, and zinc were

detected in one or more ICP-AES continuing calibration blanks. Based on blank contamination, associated sample results were qualified as follows: arsenic in samples MJAE19 and MJAE20 was qualified 'U', undetected. All other sample results were greater than five times the associated blank levels (or were already undetected) and were not qualified based on blank contamination.

6.0 ICP-AES Interference Check Sample -

The interference check sample (ICS) is analyzed by ICP-AES to verify interelement and background correction factors. Analysis is required at the beginning and end of each sample analysis run and recoveries must be between 80% and 120%. All ICS recoveries associated with reported sample results were within the recovery criterion with the exception of the recovery for zinc in the last ICS-A analysis on 11/29/98. An examination of the raw data indicates a possible carry over and/or baseline shift problem for zinc after the undiluted samples (MJAE25 and MJAE26) with extremely high zinc levels were run. Since the only zinc results reported from this day's analysis (MJAE20 and MJAE17) were analyzed before the samples with extremely high zinc levels and since the ICS-A zinc recovery in the middle ICS-A analysis (ran just before the second reported zinc result - sample MJAE17) was acceptable, no qualification was made based on the high zinc recovery in the last ICS-A analysis on 11/29/98.

The raw data for some samples had interfering levels of iron (>93,000 ug/L). Selenium and Vanadium in samples MJAE16, MJAE24, MJAE25, and MJAE26 were qualified 'UJ', estimated detection limit (possible false negatives) as selenium and vanadium in the three ICS-A analyses bracketing these samples had negative results with absolute values greater than the detection limit. Cobalt in sample MJAE16 was qualified 'J', estimated (possible high bias) as cobalt was detected in the three ICS-A analyses bracketing the sample and the estimated cobalt due to high iron exceeded 25% of the reported cobalt result.

Ten, one hundred and/or five hundred fold dilutions were required in order to report zinc, iron and/or manganese results in all samples (except MJAE17 and MJAE20) as undiluted or less diluted results exceeded the instrumental linear range for one or more of these elements. The raw data for all analytes were compared using the available dilutions to see if 1) zinc, iron and/or manganese levels in the undiluted samples were high enough that interelement corrections may not be sufficient for the analytes that were reported from the undiluted analyses or 2) a pattern of suppression or enhancement was evident.

Sample MJAE25 was analyzed at 10, 100 and 500 fold dilutions (iron reported from a one hundred fold dilution, zinc reported from a five hundred fold dilution). Aluminum, antimony, arsenic, beryllium, calcium, cadmium, cobalt, copper, magnesium, manganese, nickel, sodium, and thallium were qualified 'J', estimated (possible low bias) in sample MJAE25 as a pattern of suppression was observed when the

undiluted, 10 and 100 fold dilution analyses were compared. In addition, silver, selenium, and vanadium were qualified 'UJ', estimated detection limit (pattern of suppression/possible false negatives) and lead was qualified 'J', estimated (pattern of enhancement/possible high bias) in sample MJAE25.

Sample MJAE26 was analyzed at 10 and 100 fold dilutions (iron and manganese reported from a ten fold dilution, zinc reported from a hundred fold dilution). Calcium and magnesium in sample MJAE26 were qualified 'J', estimated (pattern of suppression/possible low bias) while selenium and vanadium were qualified 'UJ', estimated detection limit (pattern of suppression/possible false negatives), and sodium was qualified 'J', estimated (pattern of enhancement/possible high bias).

Sample MJAE21 was analyzed at a 10 fold dilution in order to report zinc within the instrumental linear range. The aluminum results in the undiluted and 10 fold dilution analyses indicated possible insufficient interelement correction for aluminum in this sample. Aluminum in sample MJAE21 was qualified 'J', estimated (possible low bias).

7.0 Duplicate Analysis - Acceptable

Duplicate analyses were done on dissolved sample MJAE19 and total sample MJAE22. Water duplicate results were within the ±20% Relative Percent Difference (RPD) or ±CRDL criteria for water results < 5 times the CRDL criteria. No qualification was made on this basis.

8.0 Field Duplicate Analysis - Not Applicable

Field duplicate analysis for samples in this SDG was not indicated in the field collection documentation.

9.0 Matrix Spike Analysis -

Matrix spike sample analyses are done to provide information about the effect of the sample matrix on digestion and measurement methods. Matrix spike recovery must be within the limits of 75 - 125%.

Matrix spike analyses were done on dissolved sample MJAE19 and total sample MJAE22. All matrix spike recoveries were within the required QC limits; with the exception of antimony (71% for dissolved, 70% for total) and selenium (74.9% for total). All antimony results were qualified 'J', estimated (suspected low bias). Selenium results were not qualified as the recovery was just outside the acceptance criteria.

10.0 Graphite Furnace Atomic Absorption Spec (GFAAS) QC - Not Applicable -

GFAAS was not used for the analysis of these samples.

11.0 ICP-AES Serial Dilution -

Dissolved sample MJAE19 and total sample MJAE22 were analyzed by ICP-AES serial dilution to check for potential interferences. All analytes which exceeded the minimum concentration criterion (50 times the IDL) agreed within the 10%D criteria; with the exception of potassium (17% for the total sample) and manganese (10.2% for the dissolved sample). All total potassium results were qualified 'J', estimated based on serial dilution results. Laboratory 'E' qualifiers were removed from the dissolved potassium results as the dissolved serial dilution for potassium was acceptable. Laboratory 'E' qualifiers were removed from all manganese results as the dissolved serial dilution was only slightly outside the criteria.

12.0 Detection Limits - Acceptable

Sample results which fall below the instrument detection limit (IDL) are assigned the value of the instrument detection limit and the 'U' qualifier is attached. Contract Required Detection Limit (CRDL) standards are required to demonstrate a linear calibration curve near the CRDL. CRDL standards were run at the required frequency.

13.0 Overall Assessment of the Data

This validation of the data is based on the criteria outlined in the *National Functional Guidelines for Inorganic Data Review (02/94)*. Approximately 19% of the data was qualified based on blank contamination, interference, matrix spike recovery or serial dilution results. The data as qualified is acceptable for all purposes.

Below are the definitions for the National Functional Guidelines for Inorganic Data Review (02/94) qualifiers used when validating/qualifying data from Inorganic analysis.

DATA QUALIFIERS

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

J - The associated value is an estimated quantity.

R - The data are unusable. (Note: Analyte may or may not be present.)

UJ - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAE16

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE16

Matrix (soil/water): WATER Lab Sample ID: 16643S

Level (low/med): LOW Date Received: 11/07/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3840			P
7440-36-0	Antimony	41.3	B	~~N~~ J	P
7440-38-2	Arsenic	552			P
7440-39-3	Barium	29.7	B		P
7440-41-7	Beryllium	1.2	B		P
7440-43-9	Cadmium	161			P
7440-70-2	Calcium	11400			P
7440-47-3	Chromium	0.90	U		P
7440-48-4	Cobalt	26.7	B	J	P
7440-50-8	Copper	148			P
7439-89-6	Iron	326000			P
7439-92-1	Lead	5770			P
7439-95-4	Magnesium	26300			P
7439-96-5	Manganese	28000		~~E~~	P
7439-97-6	Mercury	0.76			CV
7440-02-0	Nickel	28.4	B		P
7440-09-7	Potassium	865	B	~~E~~ J	P
7782-49-2	Selenium	1.9	U	J	P
7440-22-4	Silver	25.1			P
7440-23-5	Sodium	130	U		P
7440-28-0	Thallium	16.3			P
7440-62-2	Vanadium	2.9	U	J	P
7440-66-6	Zinc	70700			P
	Cyanide				NR

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAE17

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE16

Matrix (soil/water): WATER Lab Sample ID: 16644S

Level (low/med): LOW Date Received: 11/07/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	461			P
7440-36-0	Antimony	4.0	U	~~N~~ J	P
7440-38-2	Arsenic	27.3			P
7440-39-3	Barium	23.9	B		P
7440-41-7	Beryllium	0.60	U		P
7440-43-9	Cadmium	18.7			P
7440-70-2	Calcium	7350			P
7440-47-3	Chromium	0.90	U		P
7440-48-4	Cobalt	6.2	B		P
7440-50-8	Copper	26.0			P
7439-89-6	Iron	11900			P
7439-92-1	Lead	167			P
7439-95-4	Magnesium	6130			P
7439-96-5	Manganese	4020		~~E~~	P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	6.2	B		P
7440-09-7	Potassium	717	B	~~E~~ J	P
7782-49-2	Selenium	1.9	U		P
7440-22-4	Silver	1.1	U		P
7440-23-5	Sodium	459	B		P
7440-28-0	Thallium	3.6	U		P
7440-62-2	Vanadium	2.9	U		P
7440-66-6	Zinc	7781.0			~~NR~~ P
	Cyanide				NR

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAE18

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE16

Matrix (soil/water): WATER Lab Sample ID: 16645S

Level (low/med): LOW Date Received: 11/07/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1300			P
7440-36-0	Antimony	4.0	U	~~N~~ J	P
7440-38-2	Arsenic	2.0	U		P
7440-39-3	Barium	4.5	B		P
7440-41-7	Beryllium	0.86	B		P
7440-43-9	Cadmium	149			P
7440-70-2	Calcium	13200			P
7440-47-3	Chromium	0.90	U		P
7440-48-4	Cobalt	35.4	B		P
7440-50-8	Copper	52.0			P
7439-89-6	Iron	35200			P
7439-92-1	Lead	1490			P
7439-95-4	Magnesium	29300			P
7439-96-5	Manganese	39300		~~E~~	P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	33.9	B		P
7440-09-7	Potassium	747	B	~~E~~ J	P
7782-49-2	Selenium	1.9	U		P
7440-22-4	Silver	9.9	B		P
7440-23-5	Sodium	130	U		P
7440-28-0	Thallium	11.9			P
7440-62-2	Vanadium	2.9	U		P
7440-66-6	Zinc	91200			P
_____	Cyanide				NR

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJAE19

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE16

Matrix (soil/water): WATER Lab Sample ID: 16646S

Level (low/med): LOW Date Received: 11/07/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1330			P
7440-36-0	Antimony	4.0	U	~~N~~ J	P
7440-38-2	Arsenic	4.9	~~B~~	4	P
7440-39-3	Barium	14.8	B		P
7440-41-7	Beryllium	0.77	B		P
7440-43-9	Cadmium	124			P
7440-70-2	Calcium	11000			P
7440-47-3	Chromium	0.90	U		P
7440-48-4	Cobalt	17.9	B		P
7440-50-8	Copper	59.8			P
7439-89-6	Iron	35400			P
7439-92-1	Lead	1010			P
7439-95-4	Magnesium	23900			P
7439-96-5	Manganese	15000		~~E~~	P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	18.8	B		P
7440-09-7	Potassium	710	B	~~E~~	P
7782-49-2	Selenium	1.9	U		P
7440-22-4	Silver	3.6	B		P
7440-23-5	Sodium	130	U		P
7440-28-0	Thallium	5.8	B		P
7440-62-2	Vanadium	2.9	U		P
7440-66-6	Zinc	58900			P
	Cyanide				NR

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INORGANIC ANALYSIS DATA SHEET

MJAE20

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE16

Matrix (soil/water): WATER Lab Sample ID: 16647S

Level (low/med): LOW Date Received: 11/07/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	236			P
7440-36-0	Antimony	4.0	U	~~N~~ J	P
7440-38-2	Arsenic	8.9	~~B~~	U	P
7440-39-3	Barium	23.1	B		P
7440-41-7	Beryllium	0.60	U		P
7440-43-9	Cadmium	14.0			P
7440-70-2	Calcium	7450			P
7440-47-3	Chromium	0.90	U		P
7440-48-4	Cobalt	4.5	B		P
7440-50-8	Copper	18.7	B		P
7439-89-6	Iron	6020			P
7439-92-1	Lead	64.7			P
7439-95-4	Magnesium	5900			P
7439-96-5	Manganese	3560		~~E~~	P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	4.8	B		P
7440-09-7	Potassium	695	B	~~E~~	P
7782-49-2	Selenium	1.9	U		P
7440-22-4	Silver	1.1	U		P
7440-23-5	Sodium	689	B		P
7440-28-0	Thallium	3.6	U		P
7440-62-2	Vanadium	2.9	U		P
7440-66-6	Zinc	5600			P
	Cyanide				NR

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INORGANIC ANALYSIS DATA SHEET

MJAE21

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE16

Matrix (soil/water): WATER Lab Sample ID: 16648S

Level (low/med): LOW Date Received: 11/07/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1340		J	P
7440-36-0	Antimony	5.4	B	~~N~~ J	P
7440-38-2	Arsenic	2.0	U		P
7440-39-3	Barium	39.7	B		P
7440-41-7	Beryllium	1.6	B		P
7440-43-9	Cadmium	143			P
7440-70-2	Calcium	13200			P
7440-47-3	Chromium	2.4	B		P
7440-48-4	Cobalt	42.6	B		P
7440-50-8	Copper	56.8			P
7439-89-6	Iron	34300			P
7439-92-1	Lead	1380			P
7439-95-4	Magnesium	28400			P
7439-96-5	Manganese	37600		~~E~~	P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	41.0			P
7440-09-7	Potassium	719	B	~~E~~	P
7782-49-2	Selenium	1.9	U		P
7440-22-4	Silver	10.3			P
7440-23-5	Sodium	130	U		P
7440-28-0	Thallium	11.3			P
7440-62-2	Vanadium	3.8	B		P
7440-66-6	Zinc	88600			P
	Cyanide				NR

12/16/98

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INORGANIC ANALYSIS DATA SHEET

MJAE22

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE16

Matrix (soil/water): WATER Lab Sample ID: 16783S

Level (low/med): LOW Date Received: 11/17/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3420			P
7440-36-0	Antimony	4.0	U	~~N~~ J	P
7440-38-2	Arsenic	59.4			P
7440-39-3	Barium	27.8	B		P
7440-41-7	Beryllium	1.1	B		P
7440-43-9	Cadmium	216			P
7440-70-2	Calcium	33000			P
7440-47-3	Chromium	0.90	U		P
7440-48-4	Cobalt	84.2			P
7440-50-8	Copper	187			P
7439-89-6	Iron	91300			P
7439-92-1	Lead	327			P
7439-95-4	Magnesium	56100			P
7439-96-5	Manganese	34700		~~E~~	P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	77.2			P
7440-09-7	Potassium	1370	B	~~E~~ J	P
7782-49-2	Selenium	1.9	U		P
7440-22-4	Silver	10.4			P
7440-23-5	Sodium	130	U		P
7440-28-0	Thallium	11.4			P
7440-62-2	Vanadium	2.9	U		P
7440-66-6	Zinc	116000			P
	Cyanide				NR

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJAE23

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE16

Matrix (soil/water): WATER Lab Sample ID: 16784S

Level (low/med): LOW Date Received: 11/17/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3420			P
7440-36-0	Antimony	4.0	U	~~N~~ J	P
7440-38-2	Arsenic	63.1			P
7440-39-3	Barium	27.7	B		P
7440-41-7	Beryllium	1.1	B		P
7440-43-9	Cadmium	219			P
7440-70-2	Calcium	27200			P
7440-47-3	Chromium	0.90	U		P
7440-48-4	Cobalt	81.0			P
7440-50-8	Copper	186			P
7439-89-6	Iron	90500			P
7439-92-1	Lead	327			P
7439-95-4	Magnesium	50400			P
7439-96-5	Manganese	31000		~~E~~	P
7439-97-6	Mercury	0.13	B		CV
7440-02-0	Nickel	74.3			P
7440-09-7	Potassium	1120	B	~~E~~ J	P
7782-49-2	Selenium	1.9	U		P
7440-22-4	Silver	9.2	B		P
7440-23-5	Sodium	130	U		P
7440-28-0	Thallium	7.1	B		P
7440-62-2	Vanadium	2.9	U		P
7440-66-6	Zinc	116000			P
	Cyanide				NR

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAE24

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE16

Matrix (soil/water): WATER Lab Sample ID: 16785S

Level (low/med): LOW Date Received: 11/17/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6010			P
7440-36-0	Antimony	4.0	U	~~N~~ J	P
7440-38-2	Arsenic	175			P
7440-39-3	Barium	11.2	B		P
7440-41-7	Beryllium	2.2	B		P
7440-43-9	Cadmium	390			P
7440-70-2	Calcium	28800			P
7440-47-3	Chromium	0.90	U		P
7440-48-4	Cobalt	130			P
7440-50-8	Copper	325			P
7439-89-6	Iron	191000			P
7439-92-1	Lead	266			P
7439-95-4	Magnesium	51500			P
7439-96-5	Manganese	39200		~~E~~	P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	113			P
7440-09-7	Potassium	1020	B	~~E~~ J	P
7782-49-2	Selenium	1.9	U	J	P
7440-22-4	Silver	14.4			P
7440-23-5	Sodium	130	U		P
7440-28-0	Thallium	14.1			P
7440-62-2	Vanadium	2.9	U	J	P
7440-66-6	Zinc	203000			P
	Cyanide				NR

01/06/99

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAE25

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE16

Matrix (soil/water): WATER Lab Sample ID: 16786S

Level (low/med): LOW Date Received: 11/17/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	197000		J	P
7440-36-0	Antimony	155		~~N~~ J	P
7440-38-2	Arsenic	7620		J	P
7440-39-3	Barium	17.5	B		P
7440-41-7	Beryllium	33.1		J	P
7440-43-9	Cadmium	9520		J	P
7440-70-2	Calcium	129000		J	P
7440-47-3	Chromium	7.4	B		P
7440-48-4	Cobalt	2890		J	P
7440-50-8	Copper	11300		J	P
7439-89-6	Iron	13800000			P
7439-92-1	Lead	207		J	P
7439-95-4	Magnesium	302000		J	P
7439-96-5	Manganese	29600		~~E~~ J	P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	2230		J	P
7440-09-7	Potassium	300	B	~~E~~ J	P
7782-49-2	Selenium	1.9	U	J	P
7440-22-4	Silver	1.1	U	J	P
7440-23-5	Sodium	243000		J	P
7440-28-0	Thallium	149		J	P
7440-62-2	Vanadium	2.9	U	J	P
7440-66-6	Zinc	19500000			P
	Cyanide				NR

12/04/06/99

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAE26

Lab Name: SENTINEL, INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 26610 SAS No.: SDG No.: MJAE16

Matrix (soil/water): WATER Lab Sample ID: 16787S

Level (low/med): LOW Date Received: 11/17/98

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	16100			P
7440-36-0	Antimony	14.1	B	~~N~~ J	P
7440-38-2	Arsenic	287			P
7440-39-3	Barium	9.4	B		P
7440-41-7	Beryllium	7.3			P
7440-43-9	Cadmium	1650			P
7440-70-2	Calcium	52200		J	P
7440-47-3	Chromium	18.3			P
7440-48-4	Cobalt	331			P
7440-50-8	Copper	946			P
7439-89-6	Iron	1130000			P
7439-92-1	Lead	1030			P
7439-95-4	Magnesium	121000		J	P
7439-96-5	Manganese	176000		~~B~~	P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	300			P
7440-09-7	Potassium	909	B	~~B~~ J	P
7782-49-2	Selenium	1.9	U	J	P
7440-22-4	Silver	44.1			P
7440-23-5	Sodium	16500		~~U~~ J	P
7440-28-0	Thallium	72.9			P
7440-62-2	Vanadium	2.9	U	J	P
7440-66-6	Zinc	1030000			P
	Cyanide				NR

01/11/99

01/06/99

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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